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A-S

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.
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ENC2/0780

EXAMINER

ART UNIT

PAPER NUMBER

1755
DATE MAILED:

07/03/01

Please find below and/or attached an Office communication concerning this application or proceeding.

Commissioner of Patents and Trademarks

Office Action Summary

Application No.

09/711,324

Applicant(s)

KO ET AL.

Examiner

Kin-Chan Chen

Art Unit

1765

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 04 June 2001.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☐ Claim(s) _____ is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-38 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____
- 4) ☐ Interview Summary (PTO-413) Paper No(s). _____
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____

DETAILED ACTION

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

2. Claims 1-38 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ding et al. (US 5,814,563) in view of Bosch et al. (US 5,626,716).

Ding teaches that a substrate may have a dielectric layer (e.g., doped (e.g., BPSG) and undoped silicon dioxide (e.g., TEOS)), see col. 1, lines 19-21. The substrate may be etched using a fluorohydrocarbon gas selected from the group consisting of CH_3F , CHF_3 , C_2HF_5 , $\text{C}_2\text{H}_2\text{F}_2$, and $\text{C}_2\text{H}_4\text{F}_2$ (col. 2, lines 62-64). Therefore, it would be obvious to one skilled in the art that CHF_3 and $\text{C}_2\text{H}_4\text{F}_2$ are **equivalent**, containing similar etching characteristics, substitution of one for the other for etching dielectric layer would have anticipated to produce an expected result. The above $\text{C}_2\text{H}_4\text{F}_2$ reads on the limitations of "comprising $\text{C}_2\text{H}_x\text{F}_y$, where x is an integer from 3-5, y is an integer from 1 to 3 and $x + y = 6$ " in the instant claims. The dielectric layer may comprise plurality of layers. (col. 3, lines 54-62). The etching process provides high etching rates and good etching selectivity ratios (col. 2, lines 22-35).

Unlike the claimed invention, Ding does not explicitly state that the dry etchant may be formulated to etch doped silicon dioxide with selectivity over (or at faster rate in instant claim 20) at least undoped silicon dioxide. In plasma etching of semiconductors, Bosch teaches that it is known that in dry etching process, the doped silicon oxide (such as the addition of the boron and phosphorous to the oxides) is etched at a faster rate than undoped silicon oxide (col. 2, lines 9-12). In addition, Bosch teaches a process for selectively etching a structure comprising doped silicon dioxide. The structure may be exposed to a fluorohydrocarbon etchant such as CHF_3 . The structure may be removed down to an etch stop adjacent the structure and comprising undoped silicon dioxide. The removing may take place without substantially removing the etch stop (col. 2, lines 37-43; col. 4, lines 44-48). As stated above, because Ding shows that CHF_3 and $\text{C}_2\text{H}_4\text{F}_2$ are **equivalent**, containing similar etching characteristics, substitution of one for the other for etching dielectric layer would have anticipated to produce an expected result. Therefore, one skilled in the art at the time of the invention would have found it obvious to modify Ding by using the principles of Bosch to formulate the etchant of Ding (such as $\text{C}_2\text{H}_4\text{F}_2$ and others as additives) in order to provide required etching selectivity ratios.

The substitution of one known equivalent technique for another may be obvious even if the prior art does not expressly suggest the substitution. *Ex parte Novak* 16. USPQ 2d 2041 (BPAI 1989); *In re Mostovych* 144 USPQ 38 (CCPA 1964); *In re Leshin* 125 USPQ 416 (CCPA 1960); *Graver Tank & Manufacturing Co. v. Linde Air Products Co.* 85 USPQ 328 (USSC 1950).

Substitution of known equivalent structures. In re Fout 213 USPQ 532 (CCPA 1982); In re Susi 169 USPQ 423 (CCPA 1971).

As to claim 2 and 21, Bosch teaches doped silicon dioxide with selectivity over silicon nitride (col.2, lines 37-39). For the same discussion above, the etchant of Ding may be formulated to do so.

As to claims 3-7 and claims 22-26, Ding teaches these features (see col. 6, lines 1-14).

As to claims 8, 13, 27 and 32, Ding teaches using CH_2F_2 and CH_3F (col. 6, lines 1-14).

As to claims 9, 11, 16, 28, 30 and 35, Ding teaches using CF_4 and CHF_3 (col. 6, lines 1-14).

Claims 10, 12, 14, 15, 17, 18, 19, 29, 31, 33, 34,36, 37, and 38 differ from the prior art by specifying various compositions or concentrations. However, the same materials are used and the process is alike. It is the examiner's position that a person having ordinary skill in the art at the time of the claimed invention would have found it obvious to modify Bosch and Ding by using various compositions and different concentrations because same were known to be result-effective variables, and routine experimentation would have been expected to optimize them.

Response to Arguments

3. Applicants argue that that there is no suggestion to combine the references. This argument is not persuasive. As has been stated above, Bosch teaches a process for selectively etching a structure comprising doped silicon dioxide using a fluorohydrocarbon etchant (e.g., CHF_3), the structure may be removed down to an etch stop comprising undoped silicon dioxide or silicon nitride, and Ding teaches that a substrate having a dielectric layer (e.g., doped and undoped silicon dioxide), may be etched using a fluorohydrocarbon gas such as CHF_3 and $\text{C}_2\text{H}_4\text{F}_2$. Therefore, it would be obvious to one skilled in the art that CHF_3 and $\text{C}_2\text{H}_4\text{F}_2$ are **equivalent**, containing similar etching characteristics, substitution of one for the other for etching dielectric layer would have anticipated to produce an expected result. Hence, one skilled in the art would have found it obvious to substitute $\text{C}_2\text{H}_4\text{F}_2$ of Ding for CHF_3 of Bosch because Ding teaches that they are equivalent for etching dielectric layer and provide high etching rates and good etching selectivity ratios.

In response to applicant's argument that the group of fluorohydrocarbon gas is a very large group of various chemical genres and species the members thereof need only include carbon, fluorine, and hydrogen atoms, it is irrelevant to obviousness of claimed invention. Furthermore, Ding specifically discloses five fluorohydrocarbon gas may be used for dielectric layer etching as stated in the office action.

In response to applicant's argument that the prior art both Bosch and Ding require the use of additional components, as stated above, it reads on the limitation of "an etchant comprising $C_2H_xF_y$ " in the instant claims.

In response to applicant's argument that the prior art does not teach that an etchant comprising $C_2H_xF_y$, where x is an integer from 3-5, y is an integer from 1 to 3 and $x + y = 6$, may be used to dry etch doped silicon oxide with selectivity over undoped silicon oxide, as stated in the previous office actions, $C_2H_4F_2$ of Ding reads on the limitations of "comprising $C_2H_xF_y$, where x is an integer from 3-5, y is an integer from 1 to 3 and $x + y = 6$ " in the instant claims. Applicants have not traversed on same. The discussion of combining Bosch and Ding from above (first argument) is repeated here. The combined prior art teaches that same may be used to dry etch doped silicon oxide with selectivity over undoped silicon oxide.

Conclusion

4. THIS ACTION IS MADE FINAL. Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

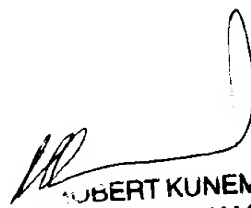
A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any

extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

5. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Kin-Chan Chen whose telephone number is 703-3050222. Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-3082934.

July 2, 2001

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ROBERT KUNEMUND
PRIMARY EXAMINER